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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/833,734 | 04/13/2001 | Masami Shirosaki | 50088-057 | 6428 |

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McDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER

MALDONADO, JULIO J

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2823

DATE MAILED: 08/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/833,734

Applicant(s)

MASAMI ET AL.

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 5, 8-12 and 15-18 rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In reference to claims 1 and 12, applicants cite "...a step of forming an electric conductive film (6a/6b)...". According to the specification, the applicants claim that the conductive layer comprises amorphous silicon (page 15, lines 23-26). However, amorphous silicon is a well-known semi-insulative material. Is the applicant claiming doped polycrystalline silicon? Furtherstill, according to claims 8-11 and 15-18, the roughened surface of the lower portion comprises amorphous silicon. However, Sandhu et al. (U.S. 6,190, 992 B1) specifies that the phase transition from amorphous silicon to polycrystalline silicon is at 550°C. Furtherstill, the specification (page 14, lines 3-24) states that the roughening of the amorphous silicon layer is conducted at temperatures of at least 590°C. Therefore, the examiner concludes that there is no support in the specification to claim a roughened amorphous silicon layer.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 5-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsieh et al. (U.S. 5,994,181) in view of the applicants admitted prior art in the instant application and DeBoer et al. (U.S. 6,046,093).

In reference to claims 5 and 12, Hsieh et al. (Figs.1-10c) in a related method to form DRAM capacitors teach the steps of forming a contact hole (46) which penetrates an interlayer insulating film (38, 40) formed on a semiconductor substrate (1); forming an electric conductive film (48) on said interlayer insulating film (38, 40) whereby said contact hole (46) is filled to obtain a contact to said substrate (1); forming an insulating film (51) on said electric conductive film (48); patterning by an anisotropic etching said insulating film (51) and said electric conductive (48) film to form a configuration so that a core and the bottom portion of said configuration are formed; forming the configuration (54) on the side of said core and said bottom portion where said configuration (54) is roughened (column 4, lines 50-52); removing said core; forming a dielectric film (60) to cover said configuration storage node comprising the configuration portion and said bottom portion; and forming a cell plate (62c) on said dielectric film (60), whereby a capacitor constituted by said configuration storage node, said dielectric film (60) and said cell plate (62) is formed (column 3, line 10 – column 5, line 35).

Hsieh et al. fail to teach that the configuration of the lower electrode is cylindrical. However, the prior art (Figs.6 and 7) teaches forming a DRAM capacitor structure in which the lower electrode (5a) is cylindrical (page 2, lines 1-12). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to form a cylindrical-shaped lower electrode as taught by the prior art in the

DRAM capacitor structure of Hsieh et al., since the selection of such geometry is part of the conventional procedures used to form DRAM capacitors (page 1, lines 14 and 15).

Hsieh et al. in combination with prior art fail to expressly teach roughening the outer wall of the cylindrical storage electrode. However, DeBoer et al. (Figs.12-16) in a related method to form DRAM capacitors teach the step of roughening the outer wall of a storage electrode (70a) (column 7, lines 19-30). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to roughened the outer wall of a storage node as taught by DeBoer et al. in the DRAM structure of Hsieh et al. and the prior art, since this would provide means of reducing the capacitor area and high storage capacitance (column 1, lines 14-67).

In reference to claims 6-11 and 13-18, the combination of Hsieh et al., the prior art and DeBoer et al. teach the step of forming the cylindrical portion on the side of the core and the bottom portion where an outer wall of the cylindrical portion is roughened comprises forming amorphous silicon on said core and said bottom portion; roughening an outer surface of said amorphous silicon by forming silicon grains in the outer surface of it; and conducting an anisotropic etching for patterning to form a side-wall like cylindrical portion at the side of said core and said bottom portion, wherein the roughening of the outer surface of the amorphous silicon is performed by a heat treatment with the use of silane and the inner wall having a roughened outer wall was originally constituted by amorphous silicon (see DeBoer et al., column 4, line 7 – column 5, line 65).

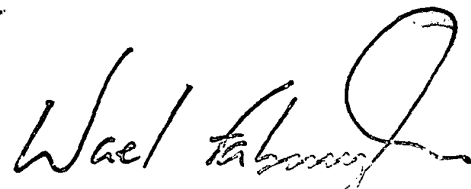
Conclusion

4. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (703) 308-4918.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

Julio J. Maldonado
Patent Examiner
Art Unit 2823
703-306-0098
julio.maldonado@uspto.gov



SUPERVISORY PRINCIPAL EXAMINER
TECHNOLOGY CENTER 2823